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EXPEDITION TO THE LARAMIE BEDS OF CONVERSE COUNTY, WYOMING.

By CHARLES H. STERNBERG, Lawrence.

THE beds consist of gray or yellowish sandstone, interlaid with redish and gray clays, and small beds of marl made up largely of fresh-water shells. The sandstone is massive, or cross-bedded, and scattered through it are concretions, usually shaped like small marbles, up to the size of large cannon-balls, eight or more inches in diameter. The most remarkable peculiarity of the sandstones are the singular shaped masses of brown siliceous material, flint-like in structure, and of the same physical conditions as the soft sandstone in which they are imbedded; either stratified or cross-bedded. They assume every conceivable form, from flattened disks to masses over a hundred feet long and less than a yard in width and thickness. They often bridge a chasm, or roof a cave, and where they are circular in form they protect the underlying strata, which rises in columns. Often many stand up free and resemble a colony of enormous mushrooms.

Fantastic forms are everywhere visible, the sculpture different than in any other formation of exposed rock I have explored. Here is the head and bust of a woman wearing a great "merry widow" hat; there a laughing baby; yonder a huge bird, sitting on a nest; and every other form the mind can imagine. As the sandstone is only held together by cohesion it disintegrates readily, and ravine after ravine is carved out of the surface of the country.

The cross-bedded strata leave marks where sections are made like the contour lines on a topographical map. In them are yellow streaks of iron oxid, as well as seams of lignite, and iron concretions; showing all that is left of some ancient bayou or marsh once rich in swamp vegetation. The iron it collected now marks their boundaries. Here, as would be imagined, are bone-beds, filled with scales of ganoid fishes, teeth of dinosaurs and other reptiles, and also teeth and bones of the rare mammal; for the Laramie of the Upper Cretaceous here is indeed the border-land between the age of reptiles and that of mammals. The great dinosaurs will appear no more in the earth's history, but a vast array of mammals hereafter will dominate land and sea. We find here also the beautifully sculptured bones of the fresh-water turtle *Trionx*, and others. I found also numerous teeth of a ray, *Myledaphus*. I discovered the type

in Montana in the similar Judith river beds, where, as assistant of Prof. E. D. Cope, we found also the first dinosaur remains in western America, except for a few teeth that Dr. F. V. Hayden found at an earlier day.

Above the cross-bedded sandstone are beds of red or gray clays topped by a stratum of flint-like structure that readily flakes off and covers the surface with angular fragments. We looked with earnest hope for the great land reptile *Triceratops*, and were so fortunate as to find a huge skull six feet and six inches long, which I sent to the British Museum.

From the remarks already made you will expect a rough and hilly country, and so it is. The main drainage canals open into the flood-plain of creek or river, but as they retreat into the hills they scour the country into deep gorges and lateral ravines. They cut through great masses of the easily disintegrated sandstones and clays, undermining hardened masses, to bridge some chasm or crown a butte or table-land that towers above in silent grandeur, breaking the monotony of this cut-up land, and serve as landmarks to the venturesome fossil hunter who, without guide or compass, enters these vast solitudes. The lateral ravines often meet and cut off a table-land, which gradually forms a haystack-like butte which stands up above the surrounding country, isolated or in groups, against the distant horizon.

This region, covering many square miles, is destitute of human life except for a few sheep and cattle men and our little party of four fossil hunters—the father and his three sons. It occupies a great basin whose outer rim is formed by the rocks of the Fox Hills and Fort Pierre of the Cretaceous. These beds mark the old shore-lines of the lakes and morasses that once occupied the country. The Fox Hills consist of yellow sandstone with great brown concretions filled with shells—amonites, graphites and bivalves, and other forms of marine life. The Fort Pierre consists chiefly of black clays in shaley structure, and contains a rich fauna of *Baculites* and other shells. I saw *Baculites* that must have been over three feet long.

These vast deposits were land when the lakes of the Laramie existed, and the rivers cut out their clays and sandstones to form the thousand or more feet of its strata. A tropical or semitropical climate, the land 5000 feet lower than at present, bayous and lakes lined with dense growths of cat-tails and other swampy vegetation, while the firmer ground supported palmettos and other trees. I see the narrow stream that silently winds among the rushes disturbed by the vibrations of a powerful tail, whose undulatory mo-

tions send off ripples in semicircular waves toward the rushes that border the land on either shore. Suddenly the water is calm, and a huge head, three feet in length, appears above the water. It is supported on a strong neck and powerful body. The expanded front part of the head forms a duck-bill that is covered with horn with sharp cutting edges, while farther back are magazines containing 2000 teeth, arranged like a pair of scissors on each side of the mouth, that shear the swamp vegetation which his clumsy hands draw into his mouth. With hind feet resting on the bottom of the stream, we cannot realize the size or power of this animal, until, weary of feeding, he pushes through the dense foliage, puts his front feet on the land and gently draws himself out of the water. A great reptile indeed! His front limbs are five feet long, shod with three hoofs and provided with an additional finger or thumb without a hoof. His huge hind limbs, eight feet long, elevate his beautifully rounded hind quarters far above the ground. He has three large toes, covered with massive hoofs, on each foot. His great flattened tail follows. As he rises on his hind feet to shake off the water that falls in cascades, the sun shining through it reveals the colors of the rainbow.

There he stands, full twenty feet in height, with his great tail, ten feet long, stretched out behind. He darts his flattened duck-bill in all directions, scenting the air, and, as if satisfied, drops to the ground and moves gracefully along on all four feet. His flexible skin is covered with scales in diamond-like patterns, arranged in horizontal and longitudinal rows. Octagonal scales fill the diamond pattern, while smaller ones, often no larger than a small pin-head, fill the spaces between. These highly colored and glittering scales blend in perfect harmony with the richly colored vegetation. Hark! What is that sound that breaks upon the ear like the roar of Niagara? Our duck-bill turns toward the water and by leaps and mighty strides seeks safety from his deadly enemy. Too late! too late! for as he cowers on his front feet and uses his powerful hind limbs as levers to assist him to spring to safety far out in the deep water, a bolt with the roar of thunder strikes him with a shock that makes the earth tremble, and the beautiful reptile receives a mortal wound and falls into the water to almost instantly sink, and a mightier than he strides the shore, giving vent to angry howls that reverberate through the forests. He is in full view for a moment, and proves to be the great tyrant of his time, *Tyrannosaurus rex*. There he is, standing on his hind feet, thirty-nine feet high, armed with great dagger-like teeth and powerful claw-

armed feet, known to science as the most terrible of the carnivorous dinosaurs.

After a few days gases form in the stomach of the dead *Trachodon*, or duck-billed dinosaur, and raise the carcass which floats on the water with back beneath and arms stretched out at right angles to the body, driven head first with the current. The head drags under the body as it drifts along; some hungry beetles have eaten through the walls of the abdomen, the gases escape and the mighty carcass, thirty feet from beak to end of tail, when the fleshy walls of the abdomen collapse, sinks to rest and burial in the quicksands below. The sand drifts into the body cavity and keep the walls in their normal position. Ages pass. Slowly the sepulcher, with all the continent west of the Mississippi, is raised to the tune of the rushing waters of the Colorado, that cut with sand and gravel a channel as rapidly as the country rises. A cañon carves through the graveyard of the *Trachodon*, cutting off and disintegrating the tail and hind feet. But before further damage can be done, in the year of our Lord 1908, late in August, two Sternbergs, with hungry eyes for ancient bones, stumble upon the grave after weeks and weeks of unremitting toil, and in a region that had been worked for years by collectors. Yes, after forty years' labor for science, lest my pride in the discovery might be too much for me, my two sons, George and Levi, have earned the glory of discovering the best specimen of a dinosaur of this form ever found.

Time would fail me to tell of all the anxiety and labor before it was delivered in the American Museum, in New York. And how, with the assistance of Professor Osborn's ablest preparators, we uncovered enough to show the bones lying in natural position, wrapped in the impressions of its folding skin. I left New York with the assurance that it would be mounted as in death. The only necessary restorations are the hind feet, one tibia and fibula and the tail, which had unfortunately been cut off by the wash. The open mounts of two fine *Trachodon* skeletons, and all that may be found, must be changed to compare with this standard, as its preparator was God Almighty. In addition to the facts enumerated, the contents of the stomach are carbonized within the abdominal cavity, and the muscles have left their impressions above the bones in the fine sandstone. With this skeleton before us, and those already known, we shall become as familiar with the old duck-bills as we are with the horse or ox or dog.